SIGNATURE PAGE

For

RESEARCH NATURE AREA ESTABLISHMENT RECORD

Valley Oak Research Natural Area

Los Padres National Forest

Monterey County, California

The undersigned certify that all applicable land management planning and environmental analysis requirements have been met and that boundaries are clearly identified in accordance with FSM 4063.21, Mapping and Recordation and FSM 4063.41 5.e(3) in arriving at this recommendation.

Prepared by _____ Date _____
Kathryn Purcell, Research Wildlife Biologist, Pacific Southwest Research Station

Recommended by _____ Date _____
John Bradford, District Ranger, Monterey Ranger District

Recommended by _____ Date _____
Jeanine Derby, Forest Supervisor, Los Padres National Forest

Concurrence of _____ Date _____
Hilda Diaz-Soltero, Station Director, Pacific Southwest Research Station

Established by _____ Date _____
Jack Blackwell, Regional Forester, Pacific Southwest Region

TITLE PAGE

Establishment Record for
Valley Oak Research Natural Area
Within
Los Padres National Forest
Monterey County, California

Valley Oak Research Natural Area

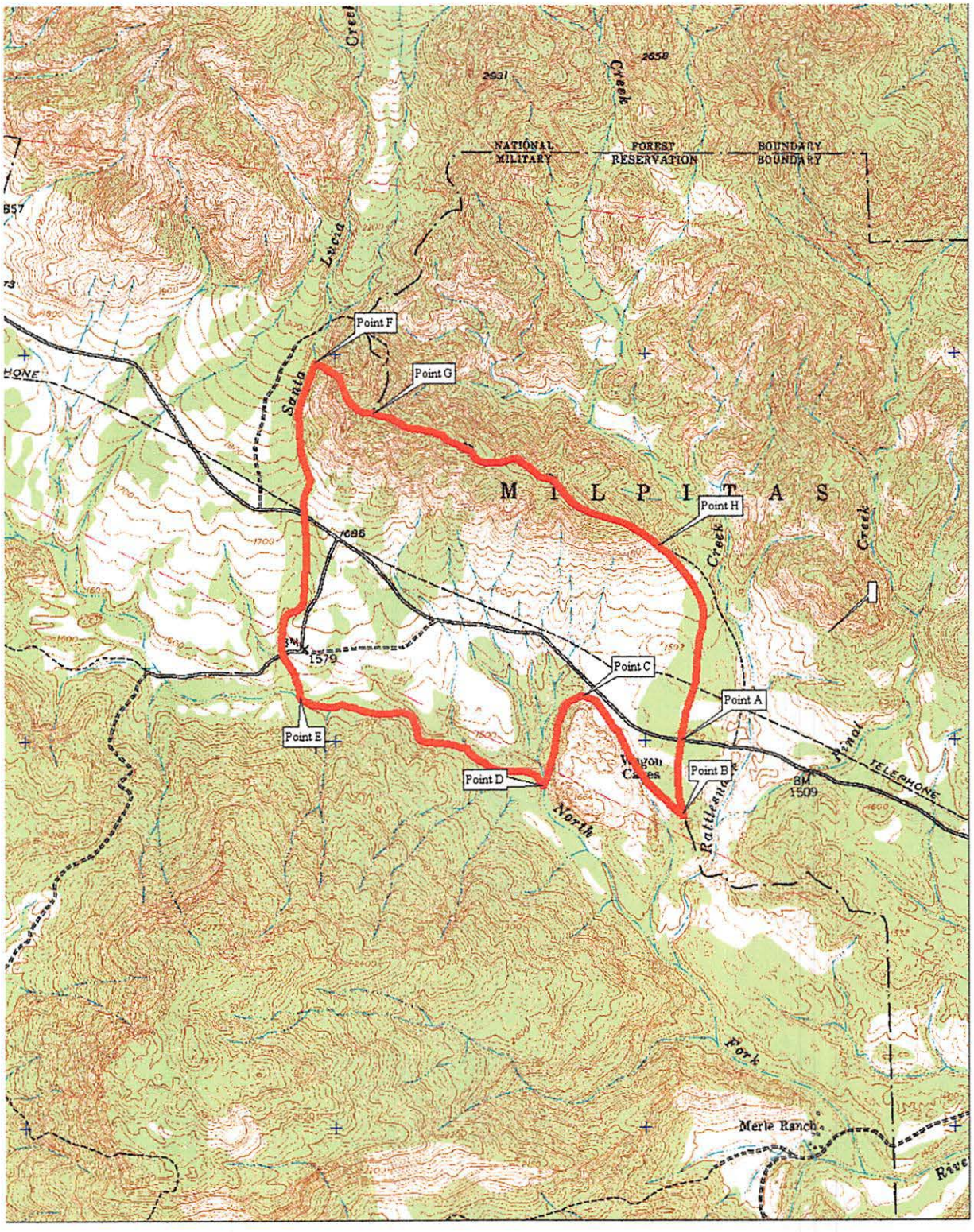
MAPS

MAP 1: Location and Access

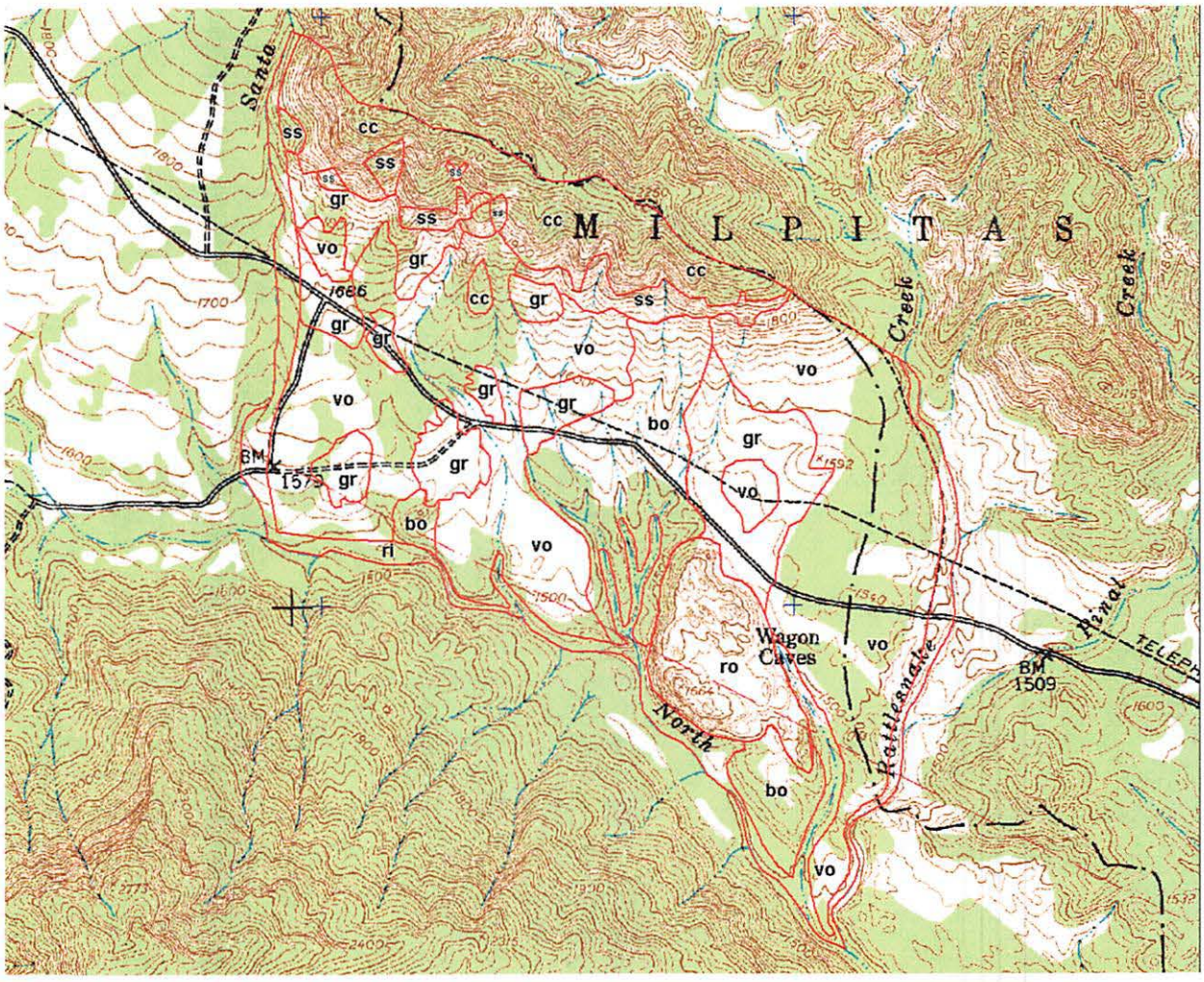
MAP 2: Boundaries

MAP 3: Vegetation Types

MAP 1: Location of Valley Oak RNA. Scale: 1: 200,000



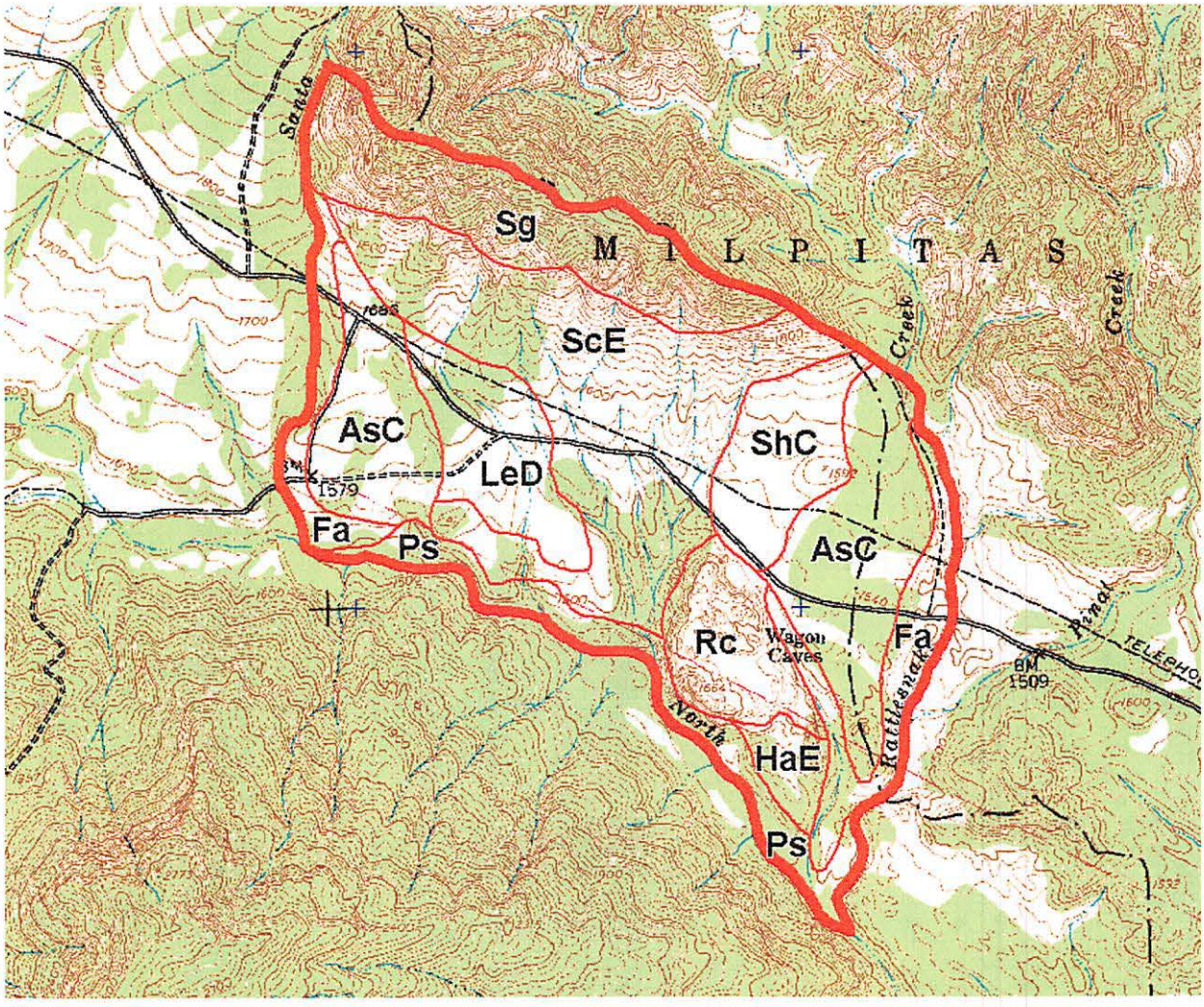
MAP 2: Boundary of Valley Oak RNA. From Junipero Serra Quad (7.5').
Scale: 1: 24,000



MAP 2: Vegetation types of Valley Oak RNA (from Keeler-Wolf 1989). From Junipero Serra Quad (7.5'). Scale: 1: 24,000

LEGEND

bo.....blue oak
vo.....valley oak
ri ..... riparian (including coast live oak)
ro..... rock outcrop
ss..... sage scrub
gr..... grassland



MAP 3: Soil Mapping Units (from Keeler-Wolf 1989). From Junipero Serra Quad (7.5')
Scale: 1: 24,000

LEGEND

AsC…Arroyo Seco gravelly sandy loam
Fa…...Fluvents, stony
HaE…Haire loam
LeD…Lockwood shaley loam
Ps…...Psamments and fluvents
Rc…...Rock outcrop-Xerothents association
ScE….San Andreas fine sandy loam
Sg…...Santa Lucia-Relez association
ShC…Santa Ynez fine sandy loam

A. INTRODUCTION

The Research Natural Area (RNA) system is a national network of ecological areas designated in perpetuity for research, education, and to maintain biological diversity on National Forest System and other federal ownerships lands. The selection of RNAs is by the identification of 'target elements', which are determined by vegetation associations within physiographic provinces. The RNA system is intended to include representative examples of common or widespread vegetation associations in each province, as well as any associations unusual or unique to that province. The Valley Oak Research Natural Area was chosen to represent the Valley Oak series (*Quercus lobata*[1]) vegetation type[2].

The Valley Oak Research Natural Area (VORNA), located in Monterey County, California, was selected and nominated as Wagon Caves Research Natural Area in 1986 by the Monterey Ranger District and Los Padres National Forest, and the land allocation was made in Los Padres National Forest Land and Resource Management Plan (USDA Forest Service 1987a). The RNA Committee contracted an ecological survey and in November, 1989 T. Keeler-Wolf completed the ecological survey of the area and submitted it to the RNA Committee. After evaluating the survey report, the PSW/Region 5 (R5) RNA Committee and Station Director recommended its candidate status in 1990. In order to differenciate the RNA from the adjacent Wagon Caves Archaeological Special Area, it was renamed Valley Oak Research Natural Area by agreement between the Los Padres National Forest and PSW Research Station in 2003.

VORNA is under the management of Los Padres National Forest. The entire area is within Management Area #66. The current site encompasses 620 acres but two alternatives have been recommended for extending the boundaries into Fort Hunter Liggett and expansion of the RNA may be considered in the future. The RNA is adjacent to Fort Hunter Liggett and the Meryl Ranch, Forest Service property acquired in 1992. The portion of Fort Hunter Liggett examined for expansion is of good quality, has not been grazed since 1992 and appears to have extensive populations of perennial native grasses. The quality of the Meryl Ranch valley oak woodland is average, likely due to the long history of farming and irrigation on this land.

1) Land Management Planning

The recommendation for establishment of the VORNA is included in the Land and Resource Management Plan (USDA Forest Service 1987a, Appendix A) and the effects of its establishment were analyzed in the Environmental Impact Statement (USDA Forest Service 1987b) for this document. Land allocation for the Wagon Caves Candidate RNA was made by the signing of the Record of Decision (ROD) for the LRMP by the Regional Forester. The RNA is included within Management Prescription [illegible] (Special Area Management), which includes one established RNA, five recommended RNAs, and two candidate RNAs (Appendix A).

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[1] All scientific names for vascular plants in this report are in accordance with The Jepson Manual (Hickman 1993).

[2] Vegetation types adapted in this report are from Holland (1986).

B. OBJECTIVES

Objectives for establishing VORNA are: (1) to enhance the Regional and National RNA systems by the addition of the Valley Oak vegetation type and its associated ecosystems within the Central California Coast Ranges ecological subregion of California (Miles and Goudy 1997). This is the only RNA selected to represent valley oak within the PSW RNA system. (2) to protect the diversity of other vegetation types, such as chamise chaparral, riparian forests, wildflower fields, cliff and crevice vegetation, and blue oak savannas. The diversity and extent of the native grasslands in VORNA are high, making it the best example of native grassland in the RNAs of California. (3) to help protect the Wagon Caves Archaelogical Special Area.

C. JUSTIFICATION STATEMENT

The proposed RNA is the only site chosen to represent the valley oak target element in the PSW RNA system. Valley oak habitat is in critically short supply and is very well represented in this area. The valley oak is a well-known tree of the lowlands and foothills of cismontane California. It has suffered extensive reductions in population as a result of land clearing and intensive management for croplands throughout most of its range (Griffin 1973, Kirn 1982, Johnson 1985). It has also become threatened through a reduction in recruitment of saplings and seedlings. The latter circumstance is a result of complex factors including predation by introduced livestock and increases in native acorn and seedling predators such as pocket gophers, deer, and ground squirrels (Griffin 1971, 1976).

The native grass and herb component in VORNA is high. Virtually all native perennial species which could have dominated the prehistoric grassland at this site are still present. In addition to the native grass species, there is a rich and diverse native herb component including patches of high density wildflower fields. Although introduced Mediterranean annuals presently dominate much of the area, a recently burned (1985) grassland within the RNA has over 50 % of its vegetation cover composed of native species. This suggests that with the proper management much of the grassland in the area could revert to high diversity native species.

Several types of riparian vegetation occur within the RNA. These contain a diversity of associated wetland plants and are homes to a variety of invertebrate and vertebrate animals. The riparian types present in the area fill gaps in the PSW RNA program for the Central Coast Live Oak Riparian Forest and Central Coast Cottonwood-Sycamore Riparian Forest.

With careful consideration and management, this area could become a useful RNA, exemplary of an ecosystem that has been strongly altered and reduced throughout the California region.

D. PRINCIPAL DISTINGUISHING FEATURES

The distinctive savannas of valley oak are a dying symbol of California. Stands of the species in VORNA are the only ones chosen within the PSW RNA system to represent the valley oak target element. Valley oak vegetation occurs as open old growth savanna with trees attaining girths of

from 5 to 7 ft (1.5 to 2.1 m) dbh in the eastern part of the area, and by younger cohorts in the northwestern part of the area. Although small in area, VORNA contains a diversity of vegetation types. These range from dense chamise (*Adenostoma fasciculatum*) chaparral, closed canopy coast live oak (*Quercus agrifolia*) and white alder-sycamore (*Alnus rhombifolia-Platanus racemosa*) riparian forests to open valley oak and blue oak (*Quercus douglasii*) savannas. Well-developed areas of introduced annual and native perennial grassland, and cliff and crevice vegetation also occur in the RNA.

The VORNA is underlain by both sedimentary and granitic rocks. Quaternary alluvium has been deposited primarily as in a broad terrace up to 0.7 mi (1.2 km) wide above the banks of the North Fork of the San Antonio River. The bold outcrops of sandstone at the southwest corner of the RNA are known as Wagon Caves.

Several types of streams are in the area, including the low gradient San Antonio River (with segments of perennial flow) and the steeper gradient, intermittent Santa Lucia Creek (also known as Sycamore Creek).

E. LOCATION (Maps 1 and 2)

(1) National Forest involved

The VORNA is located on the Monterey Ranger District, Los Padres National Forest, in Monterey County, California. No other Forest System lands are involved. The southern end of VORNA is adjacent to the Hunter-Liggett Military Reservation.

(2) Latitude/Longitude

The approximate center of VORNA is at 36°5.333'N latitude and 121°24.483'W longitude.

(3) Boundary description

VORNA lies within the west portion of the Las Milpitas Land Grant, which has not been divided into sections. It occurs within T21S, R5E, Mount Diablo Baseline and Meridian (36°05'N., 121°24'W.), USGS Junipero Serra 7.5' quad (Map 2), in Monterey County, California.

The boundaries of VORNA are delineated mostly by watercourses and Forest Service boundaries. The boundaries are described as follows (Map 2):

1. Beginning at County Rroad 4050 approximately 228.28 ft (70 m) west of Rattlesnake Creek (at the common boundary of Los Padres National Forest and Fort Hunter Liggett), elevation 1537 ft (468.5 m), 36°4.998'N, 121°23.882'W (Point A);

2. thence southerly approximately 1170 ft (357 m), along the Forest Service boundary to point between Rattlesnake Creek and Wagon Caves approximately 540 ft (165 m) west of Rattlesnake Creek, elevation 1500 ft (428 m), 36°4.810'N, 121°23.877'W (Point B);

3. thence northwesterly approximately 2550 ft (777 m), following the east side of the Wagon Caves rock outcrop to the north end of the outcrop, elevation 1536 ft (468 m), 36°5.117'N, 121°24.202'W (Point C);

4. thence southwesterly approximately 1630 ft (497 m), following the west side of the Wagon Caves rock outcrop to the North Fork San Antonio River, elevation 1460 ft (445 m), 36°4.884'N, 121°24.327'W (Point D);

5. thence northeasterly approximately 4460 ft (1359 m), following the North Fork San Antonio River to its confluence with Santa Lucia Creek, elevation 1510 ft (460 m), 36°5.114'N, 121°25.115'W (Point E);

6. thence northerly approximately 1.06 mi (1.7 km), following Santa Lucia Creek to a point at the base of a ridge that divides Los Padres National Forest from Fort Hunter Liggett, elevation 1923 ft (586 m), 36°5.973'N, 121°25.062'W (Point F);

7. thence southeasterly approximately 1282 ft (391 m), ascending the ridge to summit 2465 ft at the point where the National Forest and Fort Hunter Liggett boundary, and a fuel break meets the ridge from the north, 36°5.846'N, 121°24.875'W (Point G);

8. thence southeasterly approximately 5227 ft (1593 m), continuing along the ridge, following the fuel break and the Forest Service/Fort Hunter Liggett boundary to a point where the boundary begins to vear to the south, departing from the fuel break that continues to Rattlesnake Creek, elevation 1751 ft (534 m), 36°5.501'N, 121°23.949'W (Point H);

7. thence southeasterly and south approximately 3352 ft (1022 m) to county road 4050, the point of beginning.

(4) Acreage

The acreage for the VORNA as described above is approximately 620 acres (251ha).

(5) Elevation

Elevations in VORNA range from 1460 ft (445 m) in North Fork San Antonio River on the southern boundary of the RNA to 2465 ft (751 m) at the high point of the ridge marking the northern boundary. (Map 2).

(6) Access

VORNA is accessible from the south through Fort Hunter Liggett via the following route: From the Monterey Ranger District headquarters at King City, drive southeast on county road G14 approximately 24 miles (39 km) to Jolon. Turn northwest on the San Antonio Mission Road (county route 4050) through the Army checkpoint and continue about 19 miles (31 km) to the edge of the fort (marked by fences and cattle guards). VORNA is immediately adjacent to Fort Hunter Liggett and lies approximately 5 miles (8 km) south of the Sant Lucia Memorial Park Campground. Total mileage to the center of the RNA from King City is about 45 mi (72 km) and driving time is about 1 hour

Once within the boundaries of the RNA there are several unimproved roads branching off county route 4050, which bisects the area running northwest-southeast. These unmaintained dirt roads traverse the main savanna area on the southern side of the RNA. A loop road also leads to Wagon Caves and the open savanna area in the southeast corner. Another road along the eastern edge of the area leads northeast up to Rattlesnake Creek. From this point a fuel break runs up the chaparral-covered ridge forming the northern boundary of the area.

F. AREA BY COVER TYPES

Table 1. Area by Cover Types (acreages approximate)[1]

SAF Types (Eyre 1980)	Acres	Hectares	Percent
250 Blue oak woodland	78	32	13
Unclassified	542	219	87
Total	620	251	100

Küchler (Küchler 1966)	Acres	Hectares	Percent
26 Blue oak woodland	78	32	13
29 Chamise chaparral	92	37	15
41 Grassland	115	46.5	18
30 Sage scrub	25	10	4
Unclassified	310	125.5	50
Total	620	251	100

Holland (Holland 1986)	Acres	Hectares	Percent
71130 Valley oak woodland	207	84	33
71140 Blue oak woodland	78	32	13
42110, 42200, 42300 Grassland	115	46.5	18
32600 Sage scrub	25	10	4
37200 Chamise chaparral	92	37	15
61200, 64410 Riparian	43	17.4	7
Unclassified	60	24.1	10
Total	620	251	100

[1]Areas are for the VORNA as originally proposed, not those of Keeler-Wolf's expanded boundaries (Map 2, Keeler-Wolf 1989).

G. PHYSICAL AND CLIMATIC CONDITIONS

The VORNA lies on the eastern side of the Santa Lucia Mountains. It is in the rain shadow east of Cone Peak in the valley of the upper North Fork San Antonio River. The San Antonio River and Santa Lucia Creek flow through the area.

The area is dominated by a gently sloping alluvial terrace which has accumulated as a result of alluvial outwash from the three major drainages in the area. This terrace slopes down to the southwest toward the banks of the North Fork San Antonio River. It is over 1 km wide in some areas and runs the length of the RNA. The terrace is dissected by several small arroyos and minor rills. The intermittent streams of Rattlesnake Creek (on the southeast) and Santa Lucia Creek (on the northwest) incise the terrace as does a dendritic pattern of short drainageways converging on the northwest side of the Wagon Caves sandstone outcrops. To the northeast of the terrace is a steeply sloping ridge of shale and sandstone, the crest of which forms the northeastern boundary of the area.

Temperatures are mild in the RNA. The following information has been gleaned from Donley el at. (1979). With low elevations and proximity to the coast, the average annual range of (high to low) temperatures is likely to be relatively small, about 48 to 53°F (9-12°C). The average length of the frost free period is 300 to 330 days per year. Light frosts are fairly common in the winter months. There is an average of 30-60 days of minima below 0°C, with the coldest temperatures generally occurring in December and January, which averages between 48 and 53°F (9 – 12°C). The area has little direct marine influence; coastal fog is virtually unknown in the area. Summer temperatures may reach 110°F (43°C) in July and August, which are the warmest months. There are 30 to 60 days each year when temperatures are higher than 90°F (32°C). The average temperature of the warmest month is between 64 and 70°F (18 - 21°C). The average annual temperature is probably between 58 and 60°F (14 – 16°C).

According to Rantz (1972) the area receives approximately 30 to more than 40 inches (76 to 102+ cm) of precipitation annually. Rainfall patterns are complex in the vicinity of the VORNA, with nearby locations varying from 90 in (229 cm) to 20 inches (51 cm) annually (Keeler-Wolf 1989). Roughly 80% of the rain falls between November and April. Very little precipitation falls in the summer.

Weather data from a weather station in King City, California from 1927 to 2002 are summarized in Table 2. King City is 45 mi (72 km) from WCRNA and is lower in elevation (330 ft (101 m)) compared to the WCRNA elevation range of 1500 to 2465 ft (400 to 751 m)). Temperatures at VORNA are cooler and precipitation is substantially higher.

Table 2. Monthly summary of average maximum and minimum temperatures and average total precipitation from King City, CA. Data were obtained from the Western Regional Climate Center (http://www.wrcc.dri.edu).

Month	Average maximum temperature °F (°C)	Average minimum temperature °F (°C)	Average total precipitation Inches (cm)
January	62.5 (16.9)	35.5 (1.9)	2.25 (5.72)
February	65.5 (18.6)	38.3 (3.5)	2.34 (5.94)
March	69.1 (20.6)	39.9 (4.4)	1.97 (5.00)
April	73.9 (23.3)	41.7 (5.4)	0.82 (2.08)
May	78.3 (25.7)	45.3 (7.4)	0.22 (0.56)
June	82.6 (28.1)	48.7 (9.3)	0.07 (0.18)
July	85.1 (29.5)	51.0 (10.6)	0.01 (0.03)
August	85.0 (29.4)	50.9 (10.5)	0.03 (0.08)
September	85.1 (29.5)	48.9 (9.4)	0.13 (0.33)
October	80.1 (26.7)	44.2 (6.8)	0.40 (1.02)
November	70.6 (21.4)	38.3 (3.5)	1.09 (2.77)
December	63.6 (17.6)	35.0 (1.7)	1.84 (4.67)
Total	75.1 (23.9)	43.2 (6.2)	11.17 (28.37)

H. DESCRIPTION OF VALUES

(1) FLORA

The flora of the VORNA is relatively rich for the small area. A total of 227 species of vascular plants have been identified (Appendix B). The herbaceous vegetation of the oak woodlands, rock outcrops, and the riparian areas is particularly diverse. Despite the diversity, there are no Forest, State, or Federally listed rare or endangered species and few plants of limited distribution. The only CNPS species known from the area is *Quercus lobata* (list 4, Smith and Berg 1988). About 15% of the known flora is composed of introduced European annuals, which are well-adapted to the predominant Mediterranean savanna conditions.

The vegetation map (Map 3) is organized using the system of Holland (1986). A description of the major plant associations occurring in the VORNA follows. All scientific names are in accordance with The Jepson Manual (Hickman 1993). The codes following the association names are Holland type numbers. See table 1 for acreage of Holland and equivalent Kuchler (1966) and SAF (Eyre 1980) vegetation types.

Keeler-Wolf (1989) conducted a detailed vegetation survey of VORNA using the point-center quarter technique (Cox 1972). His survey covered his recommended RNA expansion of 806 ac (326 ha). In the valley oak woodland, 16 points were sampled on the eastern side of the RNA in an area characterized by large, old trees. Associated with these points, sixteen 50 m^2 plots were sampled to provide estimates of grass and herb cover. In the west-central portion, ten points were sampled within a stand of young valley oaks in conjunction with ten 10 m^2 plots for

herbaceous vegetation. Ten points were sampled in the blue oak woodland adjacent to the western side of Wagon Caves rocks. Associated with these points were ten 50 m^2 plots sampling understory vegetation.

1. Valley Oak Woodland (71130)

The valley oak woodlands in the VORNA occur in two main phases. Along the eastern border of the RNA the association is dominated by large old trees scattered in an open woodland (photo 1). These valley oaks are up to 7 ft (2.1 m) dbh and 100 ft (31 m) tall (photo 2). This stand occupies the broadest and most gently sloping portion of the alluvial terrace deposits. In the southwestern corner of the RNA a smaller, but similar woodland occurs with large, old specimens adjacent to the riparian corridor along Santa Lucia Creek. In between these two old growth stands in the west-central part of the area is a stand dominated by relatively young trees ranging between 10 and 35 in (25 to 89 cm) dbh and averaging 50 to 60 ft (15 to 18 m) in height. These trees range from gently sloping, dense swale border stands to more steeply sloping open hillside stands.

In general, the understories of both dense young and open old stands are similar, dominated by introduced annual herbs and grasses. In contrast to the open grasslands adjacent to the valley oak woodland, the herbaceous understory is not well stocked with native species. Beneath the oaks in semi-shade, a dense carpet of such introduced annual grasses as *Bromus diandrus*, *B. arenarius*, and *B. madritensis* ssp. *rubens frequently* forms. Many of the large oaks have California ground squirrel (*Spermophilus beecheyi*) colonies around their roots, and this disturbance fosters the presence of additional non-native herbs such as *Marrubium vulgare* and *Urtica urens*.

Dense, species-poor, non-native vegetation beneath oaks contrasts with the more open and diverse adjacent grassland, as has been found elsewhere in California under blue oaks (Holland 1974, McClaran and Bartolome 1989), coast live oaks (Parker and Müller 1982), and California black oaks (*Quercus kelloggii*; Keeler-Wolf 1986) and is apparently connected to higher nutrient levels, possible alleopathic effects, and less droughty conditions beneath oak canopies.

The tree stratum is completely dominated by valley oak with no other species present. The eastern sampling area has a mean density of 5 trees per acre (13 trees per ha) and an average basal area cover of 57 ft^2 per acre (13.14 m^2 per ha). The average tree is 44 in (1.13 m) dbh (range 19 to 78 in/0.48 to 1.98 m). This is a very open woodland which is dominated by large old trees, containing few trees under 2.5 ft (76 cm). The ages of two of the larger trees in the sample are estimated by ring counts of outer cambium layers to be around 550 years old. Few of the trees in this stand are likely to be under 200 years.

In contrast, the stand in the west-central portion of the area is composed of much younger and denser valley oak. Two 13 in (33 cm) dbh trees had ages of 83 and 88 years. A 20 in (51 cm) dbh stem was 93 years and one of the larger trees in the stand, a 34 in (86 cm) dbh specimen, was 175 years. Results from the sampling in this area indicate an average density of 79 trees per acre (195 trees per ha) with a basal area cover averaging 139 ft^2 per acre (32.0 m^2 per ha). The average tree is 18 in (45 cm) dbh (range 10.5 to 43 in/27 to 109 cm). Thus, although the average tree is substantially smaller than the average individual in the open stand, the greater densities

make up for the stature and translate to a basal area cover about 2.5 times higher than in the open stand.

The heights of the large trees in the open stand range from about 80 to 100 ft (24 to 30 m), while trees in the denser stand are 50 to 79 ft (15 to 21 m) tall. Although some of the open stand trees are senescent, as indicated by heavy mistletoe loads and large hollowed-out trunks, the majority appear healthy.

Recent reproduction in both stands is limited to seedlings. It is apparent that neither area has had any successful survivorship into sapling size classes in the past 60 to 90 years. However, seedling densities and frequencies are high.

The burst of reproduction responsible for the cohort of trees aged between 83 and 100 years is probably similar in character to those noted in other stands of blue oak and valley oak (White 1966, Vankat and Major 1978, Griffin 1977, Barbour 1988). Many stands of this age are the result of seedlings released and recruited by clearing and cutting of mature oaks throughout much of California in the late 1800s (Swiecki and Bernhardt 1998).

The understory of dense and open stands is similar. Both are dominated by annual introduced grasses and both have relatively high cover. The open stand, however, has about 20% higher average cover with almost double the cover of *Bromus diandrus*, the dominant species. Another difference between the two stand types is the occasional presence of *Toxicodendron diversilobum* in the young, dense stand. This species is the only woody understory member of the woodland and occurs as a vine clambering up oak trunks. *B. diandrus* and to a lesser extent *B. arenarius* are limited to semi-shaded areas beneath the canopy of the oaks, and are rare elsewhere in the woodland. There is a clear trend for such native species as *Nasella cernua*, *Lotus purshianus*, *Lupinus nanus*, and *Vulpia microstachys* var. *ciliata* to occur in sunnier areas away from the oak canopy. *Avena* and *Vulpia myuros* also tend to be more common in open areas.

Valley oak woodland is not completely limited to deep alluvial soils. In a small area in the north-central part of the RNA it occurs with blue oak and coast live oak on slopes up to 20° on San Andreas fine sandy loam. Trees in this area are generally small and relatively young, but occasional larger monarchs exist. In this area valley oaks are generally restricted to relatively mesic microsites such as the edges of drainageways and more northerly exposures with blue oaks on xeric west and south slopes and coast live oaks on the steeper, rocky slopes.

2. Blue Oak Woodland (71140)

This association is limited to the San Andreas fine sandy loam soils associated with the dendritic drainageways of the south-central part of the RNA (photo 3). It occurs on generally steeper and shallower soils than adjacent valley oak woodland. At the edge of the Wagon Caves escarpment, occasional foothill pine (*Pinus sabiniana*) and scrubby interior live oak (*Quercus wislizenii*) may be found within the woodland. As mentioned in the previous vegetation type, blue oak co-occurs with valley oak in a small area of steeply sloping San Andreas soil in the north-central part of the

area, but over the majority of its extent in the RNA this woodland is completely dominated by blue oak.

Compared with the valley oak woodland, the blue oak type is dominated by smaller trees of relatively uniform density and size (photo 3). Although the understory is similarly dominated by herbs and grasses, the cover and diversity of native species is markedly higher than in the local valley oak woodlands. A full 59% of the cover in blue oak woodland is composed of native species, whereas only 19 to 20% of the valley oak understory vegetation cover is native. One of the reasons for this discrepancy appears to be associated with the fire history of the two woodlands. Virtually the entire blue oak woodland southwest of the main road in the RNA sustained a ground fire in 1985. Conversely, the majority of the valley oak woodland was not affeced by this fire.

The blue oak woodland in the RNA average 66 trees per acre (162 per ha) with a mean basal area cover of 36.15 ft^2 per acre (8.30 m^2 per ha). The average dbh of trees is 13.39 in (34.0 cm). There is little evidence of reproduction and, unlike the valley oak stands, even seedlings are poorly represented. Perhaps the 1985 fire had an effect on seedling establishment and survival.

3. Grassland (42110, 42200, 42300)

This association is variable in the study area and contains elements from Holland's valley needlegrass grassland, non-native grassland, and wildflower field communities. It is typically associated with the valley oak and blue oak woodlands, but also occurs adjacent to sage scrub on the steeper lower slopes of the ridge. The majority of understory species listed for the valley oak and blue oak woodlands also occur in the local grasslands. In fact, depending on what scale they are viewed, it is difficult, if not unwise, to make distinctions between grassland and oak woodland understory. Here, grassland is considered any herb- and grass-dominated association not associated with direct canopy effects of oaks or other woody species, and not on rocky substrate.

The grassland in the RNA is a relatively open type with rarely more than about 60% ground cover. It is dominated by different species, depending on characteristics of exposure and soil development.

The modal grassland adjacent to the very open valley oak savannas of the southeastern part of the RNA is dominated by *Avena fatua*. This species is estimated to compose about 10-35% cover. *Nasella cernua* is the predominant native perennial although it usually does not occur in extensive patches (photo 4). *Bromus hordaceus* is common (approx. 5 – 10% cover) and evenly dispersed and the introduced *B. madritensis* ssp. *rubens*, *Vulpia myuros* and *V. bromoides* are scattered in small patches. Native herbs are variable in abundance. The most ubiquitous species include *Lotus purshianus, Agoseris retrorsa, Brodiaea jolonensis, Clarkia rhomboidea, C. purpurea, Daucus pusillus*, and *Lupinus nanus*. A number of non-native annual herbs occur including *Erodium cicutarium* (a dominant in late winter-early spring), *Medicago hispida, Hypochoeris glabra, Centaurea melitensis*, and *Brassica nigra*.

In addition to *Nasella cernua*, several other native grasses are scattered throughout the grassland, suggesting that with alternative management, the native component could increase. These species include: *Muhlenbergia rigens*, *Poa secunda* var. *secunda*, *P. howellii*, *Elymus glaucus*, *E. multisetus*, *Bromus carinatus*, *Koeleria macrantha*, *Melica californica*, *M. imperfecta*, *Scribneria bolanderi*, and *Vulpia microstachys* var. *ciliata*.

Dominance varies between grasses and herbs from year to year and from place to place. At least two subtypes of grasslands appear to be present in addition to the modal type described above. One of the most obvious is the native wildflower-dominated type. This is an ephemeral vegetation that exhibits spectacular mass displays of annuals in the spring. Among the important species in the subtype are *Linanthus liniflorus*, *L. ciliatus*, *Clarkia purpurea*, *C. rhomboidea*, *Lotus wrangelianus*, *Lasthenia leptalea*, *Madia gracilis*, and *Chorizanthe staticoides*.

Another type occurs often intergrading with sage scrub on shallow rocky soil derived from sandstone. This type is steeply sloping and is dominated by *Avena fatua* with a number of herbs such as *Cirsium occidentale* var. *venustum*, *Convolvulus malacophyllus*, *Lupinus nanus*, *Centaurea melitensis*, *Castilleja densiflorus*, *Plantago erecta*, *Chorizanthe membrenacea*, *Lessingia filaginifolia* var. *filaginifolia*, *Eriophyllum confertiflorum*, and *Calochortus supurbus*.

4. Sage Scrub (32600)

This association forms an irregular zone between the grassland and chamise chaparral on the steep (30 – 75%) slopes op the northeastern boundary ridge. Soils are the Reliz association and are shallow and rocky, derived from sandstone and shale.

The characteristic species in this association are *Artemisia californica*, *Yucca whipplei*, *Lotus scoparius*, *Avena fatua*, *Eriogonum fasciculatum*, *Galium nuttallii*, *G. californicum*, *Lupinus albinifrons*, *Epilobium canum*, *Stephanomeria virgata*, and *Monardella villosa*. The introduced *Avena* and the native shrub *Artemisia californica* tend to co-dominate as grassy areas interspersed with patches of shrubs. Rock outcrops are often associated with this vegetation and exposures are typically more xeric than in adjacent chaparral. Associated with the outcrops are other species such as *Mimulus auranatiacus*, *Keckiella breviflora*, *Heteromeles arbutifolia*, *Phacelia ramosissima*, *Dudleya cymosa*, *Selaginella bigelovii*, *Pholistoma auritum*, and *Pellaea andromedaefolia*. The standard southern California pattern of sage scrub occupying the lower south-facing slopes and chaparral occupying the upper more mesic slopes (e.g. Barbour and Major 1988) is repeated here.

5. Chamise Chaparral (37200)

This widespread and well-known chaparral occurs on the upper slopes of the northeastern boundary ridge. It is dominated by *Adenostoma fasciculatum*, which commonly composes 70 to 100% of the shrub cover. The entire stand was burned in the spring of 1975 in The Indians Fire. Some charred snags and sticks remain on resprouted shrubs and indicate that the pre-fire height of chamise was up to 10 ft. (3 m). Present average height is about 4.5 to 6 ft. (1.4 to 1.8 m), although shrubs of *Quercus dumosa* may be up to 20 ft (6 m).

In addition to the dominant chamise, several other chaparral shrubs occur in the area. They include *Quercus dumosa*, *Arctostaphylos glandulosa*, *Dendromecon rigida*, *Ceanothus papillosus*, *Pickeringia montana*, and *Heteromeles arbutifolia*. Just outside the RNA boundary these species are more common, forming a mixed chaparral on northeast-facing exposures,. Small areas of *Arctostaphylos* dominance occur on upper south-facing slopes within the area. Foothill pine is not present throughout most of the chaparral, but does occur sporadically in the oak woodland-sage scrub-chaparral ecotones on the mid and lower slopes. One such foothill pine was approx. 3.5 ft (1.1 m) dbh and had several recent saplings (post-fire) associated with it.

Surprisingly, several small shrubby islands of coast live oak occur on the relatively xeric upper ridge in hollows and drainageways. These trees are obvious resprouts from the recent fire. Coast live oaks also pepper the slopes down into the grassland-sage scrub and oak woodlands ecotones. The coverage of these oaks and their limited extent precludes the definiton of a separate plant association for them. Their presence in this relatively xeric setting however, approaches the extensive coast live oak woodlands they occur in throughout the hills of the mid-South Coast Ranges.

6. Rock Outcrop (no Holland equivalent)

Although the the prominent rock outcrops of Wagon Caves are excluded from the RNA, they were part of the ecological survey (Keeler-Wolf 1989). The outcrops are home to a diversity of rupicolous species (photo 5). The base of these outcrops is a transition zone between adjacent oak woodland and outcrop vegetation. The 1985 Rat Fire burned up the west and south sides of the outcrops and actually burned individual shrubs and foothill pines atop the rocks. The effect of the fire may be seen in the diversity of herbaceous species at the lower transition zone and also in the numerous resprouts of interior live oak and other woody species along the base of the rocks.

The following species are typical of the crevices and rock faces of the main outcrop: *Carex brevicaulis*, *Arctostaphylos pungens*, *Cercocarpus betuloides*, *Dudleya cymosa* ssp. *minor*, *Erigeron foliosus* var. *foliosus*, *E. petrophilus*, *Hazardia squarrosa*, *Hieracium argentum*, *Keckiella breviflora*, *Lessingia filaginifolia* var. *filaginifolia*, *Melica imperfecta*, *Mimulus aurantiacus*, *Pedicularis densiflora*, *Pterostegia drymarioides*, *Selaginella bigelovii*, and *Silene californica*.

7. Riparian Vegetation (61200, 63310)

Riparian vegetation occurs along the North Fork San Antonio River, Rattlesnake Creek (outside the RNA), Santa Lucia Creek, and a few intermittent stream courses around Wagon Caves. The San Antonio River is subject to heavy flooding in the winter months and exhibits a different physiognomy than the other riparian areas (photo 6). Although much of the riverbed is dry by mid-summer, portions of it are flowing or have pools through most of the year. It is lined with a scattered canopy of white alder, California sycamore, and willows (*Salix laevigata*, *S. melanopsis)*. Beneath this tree layer is an intermittent cover of herbaceous and woody species such as *Apocynum cannabinum*, *Datisca glomerata*, *Erigeron philadelphicus*, *Eleocharis macrostachya*, *Epilobium densiflorum*, *Castilleja* sp., and *Mentha spicata*. There are occasional

broad gravel and cobble areas not dominated by trees. These areas tend to have patches of *Baccharis viminea* and *Eriogonum fasciculatum*. Some areas of former alder and willow dominance have been reduced as a result of the 1985 fire.

The riparian situation at Santa Lucia Creek differs from the San Antonio River in that much of the creekbed is dry except during winter floods. The creek traverses the alluvial terrace and has cut a shallow boulder-strewn arroyo averaging approx. 10 to 15 ft (3 to 4.6 m) deep. In the arroyo is a scattered woodland dominated by sycamore with some patches of white alders. Above, on the levees, is a narrow riparian forest of coast live oak. Some of these coast live oaks are large with dbhs of up to 3.5 ft (1 m) and heights of 65 ft (20 m). This coast live oak forest is analogous to Holland's central coast live oak riparian forest and is very different from the scattered coast live oaks occurring in the chaparral. A small portion of this same type of forest occurs northeast of the RNA along the levees above Rattlesnake Creek.

A small stretch of Santa Lucia Creek at the northwestern corner of the RNA is permanent or semi-permanent. It is dominated by a dense narrow band of white alder. The streambed is lined with *Datisca glomerata*, *Rubus* sp., *Woodwardia fimbriata*, *Rhamnus californica*, *Umbellularia californica*, *Salix scouleriana*, *Hoita macrostachya*, *Solidago* sp., *Mimulus guttatus*, and *Stachys pycnantha*.

A few of the deeper drainageways around Wagon Caves rocks contain enough moisture in the early part of the growing season to support limited riparian growth. These channels may be lined with occasional willows (mostly *Salix lucida* ssp. *lasiandra*), *Baccharis salicifolia*, *Rubus ursinus*, *Rosa californica*, and herbs such as *Cyperus eragrostis*, *Carex barbarae*, *C. densa*, *Veronica americana*, *Epilobium ciliatum*, *Stachys pycnantha*, *Urtica dioica* ssp. *holosericea*, *Gnaphalium palustre*, and *Trifolium variegatum*.

(2) FAUNA

There are no currently Federal-, State- or CNPS-listed animal species in the area.

The VORNA contains a rich diversity of vertebrates. These range from fish such as California roach (*Hesperoleucus symmetricus*) and speckled dace (*Rhinichthys osculus*), amphibians such as foothill yellow-legged frogs (*Rana boylei*) and Pacific tree frogs (*Hyla regilla*), reptiles such as coast horned lizards (*Phrynosoma coronatum*) and common garter snakes (*Thamnophus sirtalis*), to a high diversity of birds (over 60 species reported), and abundant populations of mammals such as California ground squirrels, Merriam chipmunks (*Tamias merriami*), and Botta pocket gophers (*Thomomys bottae*). For a list of all species noted from the area see Appendix C.

The most common birds recorded in spring were European starling, oak titmouse, acorn woodpecker, Brewer's blackbird, lesser goldfinch, and northern oriole.

The population of California ground squirrels is very dense. These animals excavate elaborate burrow systems, often at the base of mature valley oaks. This species is known to prey heavily on acorns of valley oaks (Linsdale 1946). Although they gather acorns for caching, these caches are usually deep underground in burrows and thus are unlikely to result in germination.

Other acorn predators such as the Botta pocket gopher and brush mouse (*Peromyscus boylei*) were noted in the area, however neither had the high densities of the California ground squirrel. Avian acorn predators such as the acorn woodpecker and western scrub-jay, though numerous, are generally not considered to be as deleterious to the acorn crop as mammals (Koenig 1980).

(3) GEOLOGY

The area is underlain by sedimentary and granitic rocks. Quaternary alluvium has been deposited in a broad terrace up to 1 mile (1.6 km) wide above the banks of the North Fork San Antonio River. The terrace is dissected by several small arroyos and rills.

The Santa Lucia Mountains are part of the Salinian Block, a large piece of California that has been displaced northward through the strike/slip movement along the San Andreas Fault. Although these rocks are the basement series in the area, they do not outcrop within the RNA.

The most conspicuous rocks in the area are shale and sandstone. These rocks are younger than the basement series. Outcrops of Paleocene sandstone in the southwest corner form what are known as the Wagon Caves. This thick-bedded arkosic sandstone has occasional small cobbles of basement schist and granitic rocks. It weathers to rounded massive boulders and creates narrow caves and overhangs along bedding planes.

The crest of a steeply sloping ridge of Miocene shale and sandstone forms the northeast boundary of the RNA.

(4) SOILS

Soils underlying the old-growth valley oak are virtually all of granitic parent material and classified as Arroyo Seco (gravelly, sandy loam, 5 - 9 percent (3 – 5°) slopes, 60 inches (152 cm) deep). Soils underlying the younger, denser valley oak are primarily Lockwood shaley loam (9 – 15 percent (5 – 9°) slopes, 36 – 45 inches (91 – 114 cm) deep) and San Andreas fine sandy loam (15 – 30 percent (9 – 17°) slopes, 20 – 40 inches (51 – 102 cm) deep). Sant Ynez fine sandy loam (20 – 30 inches (51 – 76 cm) deep) supports the open savanna and grassland. The remaining five soil mapping units are: Santa Lucia-Reliz association, Rock outcrop, Psamments, Fluvents Stony, and Haire loam 15 – 30 percent slopes.

(5) LANDS

All lands within the Valley Oak RNA are managed by Los Padres National Forest; no private inholdings are involved.

(6) HERITAGE RESOURCES

People of the Antoniano subdivision of the poorly-known (Moratto 1984) late prehistoric (A.D. 1400-1770) Salinian culture lived in the vicinity of Wagon Caves. The Salinan occupied the coast below Lucia and the upper Salinas River drainage of the Santa Lucia Range as far south as

San Luis Obispo. Their economy was based on a Californian hunting and gathering subsistance technology that utilized both coastal and inland resources. The establishment of Mission San Antonio de Padua in 1771 and later Euro-american settlement detrimentally impacted the population and their culture, which was reduced from an estimated 3000 people to four survivers in 1933. The population is now extinct. The Salinan villages of Papuco and Tilacusam were located nearby, at the confluence of North Fork and main branch of the San Antonia River and The Indians, respectively (Hester 1978). Wagon Caves was probably a seasonal occupation site. The overhangs and caves at Wagon Caves have fire-scarred roofs and there are several bedrock mortar features associated with the caves and on horizontal slabs of sandstone adjacent to the valley oak savanna. The Salinians likely gathered acorns from the the local valley oak groves.

(7) FIRE HISTORY

Virtually the entire blue oak woodland southwest of County Road 4050 sustained a ground fire in 1985 known as the Rat Fire. The majority of the valley oak woodland was not affected by this fire, however the entire stand of chaparral burned in the spring or 1975 (Indians Fire).

I. IMPACTS/ CONFLICTS

(1) Mineral Resources

No mineral claims or oil and gas leases are known for the area. Mineral withdrawal would have no effects since potential for leasable and locatable minerals is very low.

(2) Grazing

The Wagon Caves area has been grazed since the Spanish mission period of the late 1700s. It is presently on the Upper Milpitas allotment. This is a 2200 acre (891 ha) allotment which was acquired by the Forest Service in 1954 following use by the U.S. Army (Fort Hunter Liggett). The entire RNA is within this allotment.

The season is from 1 April to 31 July, however there is also light year-round use by Forest Service stock (horses and mules). In recent years there have been 275 to 300 head of cattle on the allotment with AUM of 1584.

A report on the condition of the allotment in 1986 and 1987 mentions that milk thistle (*Silybum marianum*) and yellow star thistle (*Centaurea melitensis*) are invading due to late and unauthorized grazing in summer and early fall. The areas of heaviest impact occur along the riparian zone of the San Antonio River and in localized patches in the savanna-grassland in the central portion of the RNA.

(3) Timber

The establishment of Wagon Caves as an RNA will have no impact on the Forest's harvestable timber resources.

(4) Watershed Values

The VORNA encompasses the entire watershed of the slope and crest of a small ridge that drains into the North Fork San Antonio River. Establishment of the RNA will help protect the watershed and its associated flora and fauna.

(5) Recreation Values

A paved, well-traveled, allseason main county road (4050) passes through the RNA. The good access allows for heavy recreation use. Target shooting, fishing, rock climbing on Wagon Caves and despersed camping are the main recreational activities with its associated litter. In spite of this the ecological values of the area remain good.

(6) Wildlife and Plant Values

Establishment of the VORNA will protect and preserve the wildlife and plant values in the area. Nondesignation as an RNA would likely adversely impact the area's botanical values. Valley oak is a rare species in California. The native grass/herb component is relatively high and unusually diverse in the open grasslands and is the best example of native grassland on any R5 Research Natural Area.

Enrichment and maintenance of native grassland should be considered in the management strategy for this area. Periodic burning in the summer of fall will likely encourage diversification of grassland species while reducing cover of dominant introduced species. Livestock grazing during the spring and fall should also foster the re-establishment of native perennial grasses.

(7) Special Management Area Values

VORNA is not within any congressionally designated or special management area. Establishment of the RNA will have no conflict with Special Management Area values.

(8) Transportation Plans

Current access into the VORNA is adequate for RNA objectives. No additional roading is planned for the vicinity. Half of the RNA has been fenced to prevent OHV use. Following establishment, no road construction will be allowed within the RNA.

J. MANAGEMENT PRESCRIPTION

The primary management direction for Valley Oak RNA is the maintainance of the valley oak target element and its associates, especially the native grass/herb component. Appendix A contains management direction for RNAs on the Los Padres National Forest.

1) RNA Management Strategy

The Los Padres National Forest will develop a specific management strategy to maintain the target element and other resource values in the best possible condition. These are to maintain VORNA in a natural condition and to limit use to research, study, observation, monitoring and educational activities that are nondestructive and non-manipulative.

K. ADMINISTRATION RECORDS AND PROTECTION

The official responsibility for administration and protectionof the Valley Oak RNA is with the District Ranger, Monterey Ranger District, King City, CA 93930; Telephone: 831-385-5434. The research coordinator is the Director, Pacific Southwest Research Station, 800 Bucanan Street, Albany, CA 94710. The Director is responsible for approving and coordinating observational or non-manipulative applied research in the area and maintaining research data files.

L. ARCHIVING

The Station Director shall establish and maintain a system for archiving data and reports from Research natural Areas in a manner that will facilitate the exchange and transfer of information among Stations, Forests, and scientists.

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APPENDICES

A. Excerpts from the Los Padres National Forest Land and Resource Management Plan.

B. Vascular plant list for Wagon Caves RNA (from Keeler-Wolf 1989)

C. Vertebrate lists for Wagon Caves RNA , (from Keeler-Wolf 1989)

APPENDIX B
VASCULAR PLANT LIST

The following list includes all species identified during the field work for this ecological survey (May 20-23, 1988). Taxonomy follows Munz (1968) and Howett and Howell (1964, 1973). About 230 taxa are included. The following abbreviations refer to habitat types noted for the plants:

vo	valley oak woodland
bo	blue oak woodland
clo	coast live oak riparian forest
ro	rock outcrop
ri	riparian vegetation
cc	chamise chaparral
ss	sage scrub

Achillea millefolium; ro, bo
Adenostoma fasciculatum; cc
Aesculus californicus; rare bo
Agoseris heterophylla; burned bo
Agoseris retrorsa; bo, vo
Agrostis semiverticellata; ri
Aira caryophyllaea; swales, bo
Alnus rhombifolia; ri
Amsinkia intermedia; vo, bo
Anagalis arvensis; ro, bo
Antirrhinum multiflorum; ro
Apocynum cannabinum var. *glaberrimum*; ri
Arctostaphylos glandulosa; cc, common
Arctostaphylos pungens; ro, occasional bo
Arenaria douglasii; ro
Artemisia californica; ss
Artemesia dracunculus; bo, swales
Asclepias californica ssp. *greenei*; vo
Asclepias fascicularis; moist swales vo, bo
Astragalua douglasii; bo, ro
Avena barbata; common grassland, vo, bo, ss
Avena fatua; occasional vo, grassland
Baccharis pilularis var. *consanguinea*; cc fuel break
Baccharis viminea; ri (San Antonio R.)
Boisduvalia densiflora; ri (San Antonio R.)
Boisduvalia glabella var. *campestris*; wet swale
Brassica nigra; vo, grassland
Brickelia californica; cc fuel break, ri Santa Lucia Cr.
Briza minor; moist swale
Brodiaea jolonensis; vo, bo fairly common

Bromus arenarius; vo
Bromus carinatus; scattered vo, cc
Bromus diandrus; common shade of vo
Bromus madritensis; occas., vo
Bromus mollis; very common vo, bo
Bromus rubens; common vo, grassland
Calochortus splendens; bo, vo
Camissonia contorta var. *epilobioides*; cc fuel break
Camissonia dentata var. *campestris*; vo
Carex barbarae; ri, wet swale
Carex brevicaulis; ro
Carex densa; wet ri and swales
Carex tumicola; occas. semi-shade bo, vo
Castilleja stenantha; ri (San Antonio R.)
Caucalis microcarpa; bo, vo, common semi-shade
Ceanothus papillosus; cc fairly common
Ceanothus cuneatus; cc, uncommon
Centaurea melitensis; vo, bo, common
Cercocarpus betuloides; ro
Chorizanthe membrenacea; bo, vo, grassland occasional
Chorizanthe palmeri ?; prob this sp. (not in flower) in bo
Chorizanthe staticoides; bo, showy
Cirsium californicum; cc, lavender
Cirsium protianum; common vo , rose-red
Clarkia epiloboides; vo-clo ecotone
Clarkia purpurea ssp. *quadrivulnera*; vo, grassland
Clarkia rhomboidea; open vo, bo, grassland
Clarkia unguiculata; bo, vo, ro
Clematis lasiantha; cc
Convolvulus malacophyllus ssp. *pedicellatus*; grassland-ss ecotone
Corethrogyne filaginifolia; ro, bo
Cryptantha microstachys; cc fuel break
Cryptantha muricata; cc fuel break
Cyperus eragrostis; wet swale
Datisca glomerata; ri (Santa Lucia Cr,)
Daucus pusillus; very common vo, bo
Delphinium parryi ssp. *seditiosum*; vo, near type locality
Delphinium parryi; vo, bo, common
Dendromecon rigida; cc
Dudleya cymosa ssp. *minor*; ro, ss, both orange (Wagon Caves) and yellow forms (eastern ridge)
Elymus glaucus; vo occasional
Epilobium paniculatum; bo, ro
Epilobium adenocaulon; wet swale, ri
Eremocarpus setigerus; vo, bo summer
Erigeron foliosus var. *stenophyllus*; ro
Erigeron petrophilus; ro

Erigeron philadelphicus; ri (San Antonio R.)
Eriodictyon tomentosum; cc
Eriogonum fasciculatum; ri dry alluvium (San Antonio R.)
Eriogonum elongatum; cc occasional
Eriogonum nudum; vo, bo
Eriophyllum confertiflorum; bo, ss
Erodium botrys; vo, ro early spring
Erodium cicutarium; common grassland, vo, bo
Filago californica; bo
Filago gallica; vo, occasional
Galium andersonii; cc, bo shallow soil
Galium aparine; swales under bo, vo
Galium californicum; cc
Galium nuttallii; cc, showy bloomers in ss
Galium trifidum var. *subbiflorum*; shaded swale in bo
Geranium molle; vo common in semi-shade
Gnaphalium beneolens; ro-bo ecotone (burned)
Gnaphalium californicum; ro
Gnaphalium palustre; wet swale
Haplopappus squarrosus; ro
Helianthemum scoparium var. *vulgare;* ro, fuel break cc
Heliocharis palustris; ri (San Antonio R.)
Heliotropium curassivicum var. *oculatum*; grassland, uncommon
Hemizonia lobbii; late summer vo, bo
Heteromeles arbutifolia; cc
Hieracium argentum var. *parishii*; ro
Hordeum leporinum; vo disturbed
Hordeum geniculatum; moist swales
Hordeum californicum; swale
Hypochoeris glabra; ro, bo
Juncus balticus; vo
Juncus mexicanus; wet swale
Juncus patens; swales, rivulets
Keckiella breviflora; ro, ss
Koeleria macrantha; vo, bo, fairly common
Lagophylla congesta; bo, occas. vo
Lagophylla ramosissima; bo
Lasthenia leptalea; vo, grassland
Lathyrus vestitus; ro, (burned)
Layia ??; alt glandular leaves? cc
Layia paniculata; cc fuel break
Linanthus liniflorus; very common, displays in grassland and open vo
Linanthus ciliatus; common grassland and open vo
Lolium multiflorum; vo
Lomatium caurifolium; bo, occasional
Lonicera interrupta; occasional ro, bo

Lotus grandiflorus var. *mutabilis*; common on fuel break in cc
Lotus purshianus; common vo
Lotus purshianus; varient w/ reddish pilose foliage and small leaves, vo
Lotus scoparius; ss, cc, common
Lotus sp.*; vo* strigose annual w/ straight pods
Lotus subpinnatus; vo, bo, grassland
Lupinus albifrons; ss-grassland
Lupinus bicolor ssp. *microphyllus; bo,vo*
Lupinus concinnus var. *agardhianus;* rocky alluvium ri
Lupinus formosus ; vo
Lupinus latifolius; vo on ridge slope
Lupinus luteolus; bo
Lupinus nanus; vo, common early flower
Madia exigua; bo, grassland, common
Madia gracilis; bo, vo, occasional
Marah fabaceus; cc
Marrubium vulgare; vo disturbed
Matricaria matricarioides; road beds in vo
*Medicgo h*ispida ; swales, vo
Melica californica; vo, bo, cc-grassland, fairly common
Melica imperfecta var. *flexuosa;* ro, grassland, ss
Mentha spicata; ri (San Antonio R.)
Micropus californicus; vernally moist grassland, vo
Mimulus bifidus ssp. *fasciculatus;* ss,ro
Mimulus guttatus; ri, base of Wagon C.
Monardella villosa; ss
Montia perfoliata; vo shade
Muhlenbergia rigens; vo, bo, ss, clo, grassland
Navarretia atractyloides; bo, vo occasional
Navarretia squarrosa; cc fuel break
Orthocarpus densiflorus; vo, bo
Pedicularis densiflorus; ro
Pellaea andromedaefolia; ss
Pellaea mucronata; ro, cc
Phacelia imbricata; ro
Phacelia ramosissima; ss
Pholistoma auritum; ro, ss
Phoradendron flavescens var. *villosum*; vo
Pickeringia montana; cc, fuelbreak
Pinus sabiniana; bo, clo-cc ecotone
Pityrogramma triangularis; arroyo bo
Plagiobothrys nothofulvus; edge of moist swale
Plagiobothrys hookeriana var. *californica*; ss, upland grassland
Platanus racemosa; ri
Poa howellii; vo, bo less common
Poa scabrella; fairly common vo, bo

Polypodium californicum; ro
Polypodium monspeliensis; swales, ri
Potentilla glandulosa; ro, ri
Psoralea macrostachya; ri
Pterostegia drymarioides; ro
Quercus agrifolia; clo, ri
Quercus douglasii; bo
Quercus dumosa; cc (in*tergrades w/ agrifolia and lobata)*
Quercus lobata; vo
Quercus wislizenii; ro-bo ecotone
Ranunculus californicus; swales, bo, vo
Rhamnus californica; ri, uncommon
Rhamnus crocea ssp. *ilicifolia*; bo, ro
Rigiopappus leptocladus, common open vo, grassland
Rosa californica; ri, wet swale
Rubus occidentalis; ri (Santa Lucia Cr.) dominant understory shrub, not reported for Santa Lucia Mtns.
Rubus vitifolius ; wet swale
Rumex crispus; ri, swales
Salix laevigata; ri (San Antonio R.), wet swale
Salix melanopsis; ri (San Antonio R.)
Salix scouleriana; ri (Santa Lucia Cr.)
Sambucus mexicanus; ro, bo
Sanicula *bipinnatifida;* bo occasional
Sanicula crassicaulis; vo, bo, common
Scribneria bolanderi; bo, near rivulets
Selaginella bigelovii; ro, ss
Senecio douglasii; cc, fuel break, rare
Sidalcea malviflora ssp?; semi-shade vo
Silene californica; ro
Silene gallica; occas. bo (burned)
Silybum marianum; disturbed vo
Sitanion jubatum; scattered bo, vo
Solanum umbelliferum; ro
Solidago sp.; ri (Santa Lucia Cr.)
Sonchus asper; wet swale
Stachys bullata; dry ecotone cc-grassland
Stachys pycnantha; ri (Santa Lucia Cr.)
Stellaria media; vo shade
Stephanomeria virgata; ro, cc, ss
Stipa cernua; common open vo, bo, grasslands
Stipa lepida; cc (fuel break)
Stylocline gnaphaloides; open vo, bo
Thysanocarpus curvipes; vo, bo
Torilis japonica; vo
Toxicodendron diversilobum ; ro, ri, clo

Trichostema lanceolatum; vo, late summer
Trifolium albopurpureum; bo
Trifolium microcephalum; ri
Trifolium repens; swales, not common
Trifolium tridentatum; vo, occasional
Trifolium varigatum; swales, common
Umbellularia californica; ri (Santa Lucia Cr.)
Urtica holosericea; wet swale, ri
Urtica urens; vo disturbed semi-shaded areas
Verbena leucostachys; occasional vo
Veronica americana; wet swale
Viola pedunculata; vo
Vulpia dertonensis; vo, very common in bo
Vulpia grayi; occasional bo, vo, grassland
Vulpia myuros; common bo, vo
Woodwardia fimbriata; ri (Santa Lucia Cr.)
Yucca whipplei var. *percursa*; ss
Zauschneria californica ssp. *mexicana*; ro, cc, ss

APPENDIX C
VERTEBRATES NOTED FROM WAGON CAVES CANDIDATE RNA

This list is largely limited to species noted from the area during the fieldwork for this survey in May 1988. A few additional species of birds are listed on the basis of observations on November 11, 1989. Only two species, the turkey and the feral pig have been included on the basis of Introduction reports on file with the Ranger District at King City. Numbers in parentheses following some bird names represent numbers tallied on a 10 ha belt census conducted May 21, 1988 in the open valley oak savanna. Abbreviations following the species names refer to habitats as they are abbreviated in Appendix B. Authorities for names are given following each class heading.

Fish (Moyle 1976)
California roach (*Hesperleucus symmetricus*); Santa Lucia Cr.
Speckled dace *(Rhinichthys osculus)*; San Antonio R.

Amphibians (Stebbins 1985)
Pacific tree frog (*Hyla regilla*); swales, ri
Foothill yellow-legged frog *(Rana boylei)*; ri (San Antonio R.)

Reptiles (Stebbins 1985)
Western pond turtle (*Clemmys marmorata*); swale, drainage channel near San Antonio R.
Western fence lizard (*Sceloporus occidentalis*); vo
California whiptail (*Cnemodophorus tigris*); ri, vo, cc
Northern alligator lizard (*Gerronhotus coeruleus*); cc
Coast horned lizard (*Phrynosoma coronatum*); cc
Common garter snake (*Thamnophus sirtalis*); swale near San Antonio R.

Birds (Robbins et al. 1983)
Mallard; ri (San Antonio R.)
Turkey vulture; overhead
Red-tailed hawk; overhead, ro
Golden eagle; f lying over Wagon Caves rocks Nov. 11, 1989
Cooper's hawk; flying over vo savanna Nov. 11, 1989
American kestrel; vo, grassland
Turkey; introduced in area according to records at R.D.
Common snipe; swale adjacent to Wagon Caves Nov. 11, 1989
California quail; (1) occasional cc, vo, ri
Mountain quail; cc, ro
Mourning dove; (4) common vo, bo, ri
Band-tailed pigeon; (6) common vo
Great horned owl; 3-4 scared out of caves at Wagon Caves rock escarpment
Barn owl; vo (open savanna)
White-throated swift; overhead throughout especially ro
Anna's hummingbird; (1) vo, cc, ri
Black-chinned hummingbird; common ro, cc, bo

Acorn woodpecker; (13) very common vo, bo
Northern flicker; (3) vo, bo, ri
Nuttall's woodpecker; (3) vo, bo, ri
Downy woodpecker; ri (Santa Lucia Cr.)
Ash-throated flycatcher; (5) common vo, cc, bo
Western kingbird; (1) vo, grassland
Olive-sided flycatcher; ri (Santa Lucia Cr.)
Western flycatcher; ri (Rattlesnake Cr.)
Black phoebe; ri, nesting in culvert (Santa Lucia Cr.)
Violet-green swallow; (5) common vo (nest holes), ri, overhead
Cliff swallow; ro, ri
Western Scrub-jay; (1) common bo, vo, cc
Steller's jay; (1) uncommon clo, Rattlesnake Cr.
Yellow-billed magpie; vo, bo, ri
Plain titmouse; (17) very common vo, bo, cc
Bushtit; bo, cc
White-breasted nuthatch; (8) very common vo, bo
House wren; (2) occasional vo, bo, ri
Canyon wren; nest in Wagon Caves rocks
Bewick's wren; ro, cc
Blue-gray gnatcatcher, (4) vo, bo, cc
Ruby-crowned kinglet; common bo, Nov, 11, 1989
American robin; (4) common, vo, ri, bo
Western bluebird; (1) fairly common vo, bo, ri, ro
Hermit thrush;
Wrentit; cc
Phainopepla; (2) vo
Starling; (18) very common vo, grassland
Cassin's vireo; (1) vo occasional
Warbling vireo; ri (Rattlesnake Cr. Santa Lucia Cr.)
Black-throated gray warbler; cc
Orange-crowned warbler; cc
Nashville warbler; ri, clo (Santa Lucia Cr.)
Wilson's warbler; ri (Santa Lucia Cr,)
Yellow warbler; ri (San Antonio R.)
Black-headed grosbeak; ri, cc
Lazuli bunting; cc
Spotted towhee; (1) cc, vo, ri
Brown towhee; (1) ri, cc, vo ecotone
Western meadowlark; grassland
Brown-headed cowbird; (1) grassland, vo
Brewer's blackbird; (13) common grassland, vo, ri
Northern oriole; (10) common vo, ri
Dark-eyed junco; (1) vo, grassland
Chipping sparrow; (1) vo, bo
Lark sparrow; vo, ss

Golden-crowned sparrow; common Nov. 11, 11989
Lesser goldfinch; (12) common vo, bo, ri, cc
House finch; (1) occasional vo, r!
Purple finch; vo, occasional

Mammals (Jameson and Peeters 1988):
Feral pig (*Sus scrofa*); introduced in area according to records at R.D.
Botta pocket gopher (*Thomomys bottae*); common vo, bo, grassland
Dusky-footed woodrat (*Neotoma fuscipes*); middens and nests common in Wagon Caves rocks
California ground squirrel *(Spermophilus beecheyi);* very common grassland, vo, bo
Brush mouse (*Peromyscus boylii*); ri, vo, clo ecotone (trapping success 8.3%)
Brush rabbit (S*ylvilagus bachmani); cc*
Gray fox (U*rocyon cinereoargenteus); cc* (scat)
Coyote *(Canis latrans); cc* (scat)
Black-tailed deer (*Odocoileus hemionus*); cc, vo
Merriam chipmunk (*Tamias merriami*); cc, vo

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TEMP. (1)	PERMANENT (To be filled in by the WO) (2)	(3)	(4)	(5)	(6)	(7)
				All: Wagon Caves RNA, California, Los Padres NF, Monterey R.D. Monterey Co.		
			Nov 1989		Photo 1. View looking north through the open valley oak savanna on the eastern side of RNA.	C
			Nov 1989		Photo 2. Mature, healthy valley oak in the open savanna. This specimen is 53 in (135 cm) dbh and 80 ft (24 m) tall.	C
			Nov 1989		Photo 3. Overview of blue oak woodland west of Wagon Caves rocks. Photo taken from northeastern boundary ridge looking south.	C
			Nov 1989		Photo 4. View of grassland adjacent to open valley oak savanna. Tall fruiting grass in foreground is *Stipa cernua*.	C
			Nov 1989		Photo 5. View overlooking a portion of Wagon Caves rocks with associated cliff and crevice vegetation. Photo is facing northeast with chamise chaparral-topped boundary ridge in background.	C
			Nov 1989		Photo 6. Riparian situation at North Fortk of the San Antonio River near the northwest base of the Wagon Caves rocks.	C